

WHAT IS CLAIMED IS:

- 1 1. A lithography reticle, comprising:
2 a material having a pattern, the pattern including opaque regions and transparent regions,
3 the pattern comprising a holographic representation of an image, wherein the holographic
4 representation of the image is formed using a Computer-Generated Holography encoding
5 technique.
- 1 2. The lithography reticle according to Claim 1, wherein the material comprises:
2 a transparent substrate; and
3 an opaque material disposed over the substrate, wherein the pattern is formed in the
4 opaque material.
- 1 3. The reticle according to Claim 1, wherein the holographic representation of an image
2 comprises a holographic fringe pattern.
- 1 4. The reticle according to Claim 3, wherein the holographic fringe pattern comprises a
2 plurality of small apertures, wherein the apertures do not visually resemble the image in a one-to-
3 one relationship.
- 1 5. The reticle according to Claim 1, further comprising a phase-shifting material disposed
2 over portions of the material.
- 1 6. The reticle according to Claim 1, wherein the reticle is transmissive or reflective.
- 1 7. The reticle according to Claim 1, wherein the material comprises a liquid crystal display
2 or a special light modulator.

- 1 8. A method of manufacturing a lithography reticle, comprising:
2 providing an image;
3 creating a holographic representation of the image using a local encoding technique
4 (LET);
5 providing a material; and
6 patterning the material with the holographic representation of the image, wherein the
7 patterned material comprises transparent regions and opaque regions.
- 1 9. The method according to Claim 8, wherein patterning the opaque material with the
2 holographic fringe pattern comprises patterning the opaque material with a plurality of small
3 apertures, wherein the apertures do not visually resemble the image in a one-to-one relationship.
- 1 10. The method according to Claim 8, wherein providing the material comprises providing a
2 substrate and disposing an opaque material over the substrate, wherein patterning the material
3 comprises patterning the opaque material.
- 1 11. The method according to Claim 10, further comprising forming at least one phase-
2 shifting region over a portion of the substrate.
- 1 12. The method according to Claim 8, further comprising providing a look-up table, the look-
2 up table including a plurality of fringe patterns for light sources, wherein creating the
3 holographic representation of the image comprises referring to the look-up table.
- 1 13. The method according to Claim 8, wherein creating the holographic representation of the
2 image comprises partitioning the image to a plurality of areas, and creating a holographic
3 representation of each area.

- 1 14. The method according to Claim 8, wherein providing the material comprises providing a
- 2 liquid crystal display or a special light modulator.

1 15. A method of patterning a target, comprising:
2 providing a target, the target having a top surface, the target top surface having a material
3 layer disposed thereon, a first photoresist layer disposed over the material layer, a transparent
4 spacer material disposed over the first photoresist layer, and a second photoresist layer disposed
5 over the spacer material; and
6 patterning the second photoresist layer of the target with a holographic fringe
7 representation of an image.

1 16. The method according to Claim 15, further comprising using the second photoresist layer
2 to pattern the first photoresist layer with the image.

1 17. The method according to Claim 16, further comprising using the first photoresist layer to
2 pattern the material layer of the target with the image.

1 18. The method according to Claim 15, further comprising:
2 providing a lithography reticle, the reticle comprising a pattern of transparent regions and
3 opaque regions, the pattern comprising the holographic fringe representation of an image to be
4 patterned on the material layer of the target; and
5 using the lithography reticle to pattern the second photoresist layer of the target with the
6 holographic fringe representation of the image.

1 19. The method according to Claim 18, wherein the lithography reticle is transmissive,
2 wherein using the lithography reticle to pattern the second photoresist layer of the target
3 comprises exposing the second photoresist layer to an energy source through the reticle.

1 20. The method according to Claim 18, wherein the lithography reticle is reflective, wherein
2 using the lithography reticle to pattern the second photoresist layer of the target comprises
3 reflecting energy emitted from an energy source to the second photoresist layer.

1 21. The method according to Claim 18, wherein the holographic fringe representation of the
2 image comprises a plurality of small apertures, wherein the apertures do not visually resemble
3 the image in a one-to-one relationship.

1 22. The method according to Claim 18, wherein providing a lithography reticle comprises
2 providing a reticle comprising phase-shifting regions.

1 23. The method according to Claim 15, wherein the target comprises a semiconductor wafer.

1 24. A semiconductor device patterned according to the method of Claim 23.

- 1 25. A method of patterning a target, the method comprising:
2 providing a target, the target having a top surface, the target top surface having a
3 photoresist layer disposed thereon;
4 providing a lithography reticle, the lithography reticle comprising a holographic
5 representation of an image to be patterned on the target;
6 patterning the photoresist layer with a three-dimensional pattern using the lithography
7 reticle;
8 depositing a material layer over the photoresist layer; and
9 removing the photoresist layer, leaving three-dimensional structures comprised of the
10 material layer disposed over the target.
- 1 26. The method according to Claim 25, further comprising using a two-photon process to
2 pattern the photoresist layer.
- 1 27. The method according to Claim 25, wherein the three-dimensional structures comprise
2 dual-damascene structures.
- 1 28. The method according to Claim 25, wherein the three-dimensional structures comprise a
2 multi-level interconnect structure.
- 1 29. The method according to Claim 28, wherein the target comprises a semiconductor wafer.
- 1 30. A semiconductor device patterned according to the method of Claim 29.